

IN THE SPECIFICATION

Please replace the paragraph beginning on page 1, line 15 of the application as filed with the following paragraph:

- - One installation for achieving atomized bitumen in steam is found in US Patent No. 6,003,789. It uses a mixing assembly or apparatus as is illustrated in Figure 1 therein, wherein an atomizing nozzle 20 is mounted in the wall of the reactor, a cylindrical conduit 24 is attached to the nozzle and a pair of parallel conduits 25 and 26 are provided for introducing steam and bitumen respectively into the main conduit 24, conduit 26 being ~~upstream~~ downstream of conduit 25. It will be noted that the conduits 25 and 26 meet the conduit 24 generally at right angles with respect thereto. A flow-accelerating nozzle 22 is provided in the conduit 24 between the junctures of the steam and bitumen conduits 25 and 26 with the conduit 24. The nozzle 22 is intended to increase the flow velocity of the steam to improve break-up of the bitumen into bubbles or droplets. A valve is shown at the end of the conduit 24 opposite the atomizing nozzle 20 and ~~downstream~~ upstream of the steam conduit 25, for use in introducing a cleaning rod into the conduit 24. The rod is used to clear blockages within the conduit 24 and the atomizing nozzle 20. It will be apparent that the minimum orifice size of the nozzle 22 cannot be less than the diameter of the cleaning rod, since the nozzle 22 is located within the main conduit 24. Otherwise, the cleaning rod could not pass along the full length of the main conduit. This places a limitation on the efficiency of the entire apparatus.- -

Please replace the paragraph beginning on page 2, line 20 of the application as filed with the following paragraph:

- - The present invention, like the prior art, utilizes the formation of small bubbles of gas (steam) to carry the liquid phase (bitumen) to the atomizing nozzle. The present invention will enhance the formation of bubbles in such multi- or 2-phase flow. Specifically, with the arrangement of the present invention there is ~~enhance~~ enhanced formation of bubbles less than 2mm in diameter that are evenly distributed within the flow downstream of the point at which the gas and liquid phases are mixed. By providing a "bubbly flow" with this arrangement, the liquid is dispersed and

is more easily atomized than with other types of 2-phase flow, such as slug or annular flow. The bubbles of gas in the liquid enhance downstream atomization through the exit orifice by the nature of the gas phase compressibility. By producing a uniform distribution of fine bubbles in the flow, the liquid is broken down into small webbed or ligament structures that are more easily broken into droplets when the gas decompresses at the nozzle exit. The uniformity of bubble distribution within the liquid ensures a near constant (with respect to time) gas-to-liquid mass ratio thereby giving consistent atomization (or droplet size). The flow has a minimal pulsing in it, thereby minimizing variations in the atomization over any period of time. This is in contrast to other designs of 2-phase flow mixing devices that may or may not produce a bubbly flow. For example, if there is a slug type flow, a large variation (with time) of the gas-to-liquid mass ~~ration~~ ratio at the nozzle tip can result, causing significant degradation in atomization efficiency.

Please replace the paragraph beginning on page 3, line 13 of the application as filed with the following paragraph:

- - In summary of the above, the present invention may be considered as providing an arrangement for feeding a mixture of bitumen and steam to a reactor for further processing of atomized bitumen within the reactor comprising: an atomizing nozzle connected to a wall of the reactor and opening to an interior of the reactor, the nozzle being adapted to atomize bitumen carried by steam into droplets suitable for such further processing; a main conduit having a main axis, connected at a proximal end to the nozzle and including openable closure means at a distal end thereof; a first feed conduit having a first axis and connected to a source of bitumen, the first conduit being in a first plane containing the main and first axes, the first feed conduit joining the main conduit at an angle in the range of 30° to 60° as defined between the main and first axes ~~downstream~~ upstream of the junction between the main and first conduits; a second feed conduit having a second axis and connected to a source of steam, the second conduit being in a second plane containing the main and second axes, the second feed conduit joining the main conduit ~~downstream~~ upstream of the junction between the main and first conduits at an angle in the range of 20° to 40° as defined between the main and second axes ~~downstream~~ upstream of the junction between the main and second conduits; and flow-accelerating nozzle means positioned in the second feed conduit

upstream of the juncture between the main and second conduits.- -

Please replace the paragraph beginning on page 3, line 29 of the application as filed with the following paragraph:

- - The present invention may also be used with oil and steam processing equipment and can be used with existing atomizing nozzles already provided within a reactor. Thus the present invention may also be considered as providing a mixing arrangement for feeding a mixture of oil and steam to an atomizing nozzle connected to a reactor for further processing therein, comprising: a main conduit having a main axis, for connection at a proximal end thereof to the nozzle and including openable closure means at a distal end thereof; a first feed conduit having a first axis and connected to a source of oil, the first conduit being in a first plane containing the main and first axes, the first feed conduit joining the main conduit at an angle in the range of 30° to 60° as defined between the main and first axes ~~downstream~~ upstream of the junction between the main and first conduits; a second feed conduit having a second axis and connected to a source of steam, the second conduit being in a second plane containing the main and second axes, the second feed conduit joining the main conduit ~~downstream~~ upstream of the junction between the main and first conduits at an angle in the range of 20° to 40° as defined between the main and second axes ~~downstream~~ upstream of the junction between the main and second conduits; and flow-accelerating nozzle means positioned in the second feed conduit upstream of the juncture between the main and second conduits.- -

Please replace the paragraph beginning on page 4, line 16 of the application as filed with the following paragraph:

- - The invention furthermore can be used with liquid processing equipment in which a heavier, incompressible, fluid is carried by a lighter, compressible, fluid to a location for further processing. Such invention thus may be considered as providing a mixing arrangement for feeding a mixture of a heavier, generally incompressible, fluid and a lighter, compressible, fluid to a location for further processing therein, comprising: a main conduit having a main axis, for connection at a

proximal end thereof to processing apparatus at the location; a first feed conduit having a first axis and connected to a source of the heavier fluid, the first conduit being in a first plane containing the main and first axes, the first feed conduit joining the main conduit at an angle in the range of  $30^\circ$  to  $60^\circ$  as defined between the main and first axes ~~downstream~~ upstream of the junction between the main and first conduits; a second feed conduit having a second axis and connected to a source of the lighter fluid, the second conduit being in a second plane containing the main and second axes, the second feed conduit joining the main conduit ~~downstream~~ upstream of the junction between the main and first conduits at an angle in the range of  $20^\circ$  to  $40^\circ$  as defined between the main and second axes ~~downstream~~ upstream of the junction between the main and second conduits; and flow-accelerating nozzle means positioned in the second feed conduit upstream of the juncture between the main and second conduits. - -

Please replace the paragraph beginning on page 5, line 27 of the application as filed with the following paragraph:

- - There are two supply or feed conduits connected to the main conduit 34, namely a first or bitumen feed conduit 42 and a second or steam feed conduit 44. Conduit 42 has a longitudinal or first axis 46 and conduit 44 has a longitudinal or second axis 48. The main conduit has its own longitudinal or main axis 50. The conduits are set out such that the main and first axes 50, 46 are in a first plane  $P_1$  and the main and second axes are in a second plane  $P_2$ . Furthermore, as seen in the drawings the first conduit 42 intersects the main conduit 34 at an acute angle  $\alpha$  defined between the main and first axes ~~downstream~~ upstream of the junction between the first and main conduits, while the second conduit 44 intersects the main conduit 34 at an acute angle  $\beta$  defined between the main and second axes ~~downstream~~ upstream of the junction between the second and main conduits. It has been found that the angle  $\alpha$  preferably will be within the range of  $30^\circ$  to  $60^\circ$  while the angle  $\beta$  will be within the range of  $20^\circ$  to  $40^\circ$ . For optimum performance of the mixing arrangement of this invention the angle  $\alpha$  will be about  $45^\circ$  and the angle  $\beta$  will be about  $30^\circ$ . - -